Vector vs. Raster Images

If you have participated in efforts like the *ATE Impacts* book or the ATE Convergence Labs, you may have had us ask for **vector** image files as opposed to **raster** image files for graphics. You may have heard these terms and don’t know what they mean or have never encountered them before. If so, this guide is for you – it will briefly explain the difference between these two image file types, what files formats exist for each, and when each type is best utilized.

# Raster Images

Most of the image files you’re familiar with are probably raster images – they’re sometimes called bitmap images. **Raster images are made up of pixels**, the number of which is fixed and depends on the file type and size, and the quality of the image is dependent on the image’s resolution (how many pixels make up the image). When you zoom in enough on a raster image or try to enlarge one, you will start to see the individual pixels. If you try to scale a raster image down, the pixels may start to “cram together” and the image may lose quality.

None of this is to say that raster images are inferior or don’t have their uses! Raster images are **best for photographs** in particular.

Raster image file types include JPG/JPEG, PNG, WEBP, BMP, PSD, and TIFF**. JPG is best for photographs,** and **PNG or WEBP are best for non-photographic images**. Additionally, vector images can easily saved as raster images when necessary – simply save or export the image as one of these file types.

# Vector Images

**Vector images use mathematical equations and fixed points to produce an image** – no pixels involved! This allows them to be “resolution independent”, meaning they **maintain sharpness and quality at any scale**. If you zoom in or enlarge, you will still see smooth lines and curves, and if you shrink the image down, the image will not become “crammed” or “fuzzy”.

**Vectors are best for things like logos, illustrations, and graphics** – anything that might need to be scaled up or down often and used for multiple projects. Because print typically uses much higher resolution than displaying on a screen, using vector image formats is particularly important if you might be using the image in printed materials.

Vector image file types include **SVG, EPS, and AI**. Any of these file types are acceptable for our purposes. **Raster files cannot simply be saved in a vector format and become vector images**. If the image was a raster to begin with, it will still be a raster. It is possible to convert a raster to a vector using a process built into image editing software like Adobe Illustrator, but the quality of this conversion is often inferior to the original, and the result may need significant additional manual editing to be usable.

# Vector vs. Raster: Example



In this example, the rocket ship on the left is a vector image. In the green circle, you can see that, despite being scaled up/zoomed in on, the image remains smooth – it will look like this no matter what. The rocket ship on the right is a raster image – in the red circle, the scaled-up/zoomed-in version of the same image loses quality and you can see its individual pixels.

The difference between vector and raster images may seem arbitrary at times, but if/when you are ever asked to provide one or the other, please understand that it’s usually for a good reason – depending on what the image is and what it’s needed for, the difference can be vital.

If you’re not sure which type of image file you have, check the file type. As mentioned above, JPG/JPEG, PNG, WEBP, BMP, PSD, and TIFF are all raster files. SVG, EPS, and AI are usually vector files. Another quick trick is to zoom very far in on the edge of the image, like in the example above – if it’s jagged, fuzzy, or blurry, you have a raster. If it’s still smooth and sharp, you have a vector.

If you find you are in need of a vector image but don’t have one, try going back to the person who originally made it, or the files they used to create it. Logos in particular are almost always initially made as vector images. Otherwise, you can try reaching out to your institution’s outreach and/or marketing team – they usually have a graphic designer who may be able to help.